Received 21 March 2013
Revised 12 July 2013
8 October 2013
21 October 2013
5 December 2013
Accepted 6 December 2013

Implication of inside-debt: signalling for bankruptcy probabilities within small firms

Raul Seppa
Faculty of Economics and Business Administration, University of Tartu, Tartu, Estonia

Abstract

Purpose – Small privately held firms extensively use debt provided by principal owners and households (inside-debt) as an alternative capital source to straight equity capital. The purpose of the research study is to investigate inside-debt-bankruptcy relations.

Design/methodology/approach – Inside-debt-bankruptcy relation is tested on three prominent bankruptcy prediction models using correlation and logit regression analysis. Sample consists of 314 Estonian small firms. Financial reports of 2007 are modelled against bankruptcies declared in 2009.

Findings – Results imply that users of inside-debt are less profitable; they have weaker liquidity position and less retained earnings. Leverage is not found to be significant determinant between inside-debt users and non-users. Fundamental finding of the study suggests that the use of inside-debt is significantly and positively related to bankruptcy probability. While inside-debt carries no risk elements *per se*, findings are robust to indicate that the use of inside-debt has significant power to signal for increasing bankruptcy risk and as such, reducing information asymmetry of small firms.

Research limitations/implications – This study is limited to single country data. Bankruptcy data fall to the period of economical recession. It is suggested to repeat the study in a normal economical situation and to extend sample size over different countries.

Practical implications – Findings contribute to the understanding of firms' financial risk, firm behaviour and capital structure development. In a lending industry, results shall supplement to prudent credit risk assessment techniques and design of bankruptcy models in general.

Originality/value – To the author's best knowledge, inside-debt-bankruptcy relation is not studied so far in the existing academic literature.

Keywords Capital structure, Small firms, Inside-debt, Probability of bankruptcy

Paper type Research paper

1. Introduction

In academic literature, the capital structure of small firms is seen as a mixture between debt and equity. The most commonly observed debt contract is the so-called standard debt contract, which calls for non-contingent repayment of principal plus interest. Whenever this repayment does not occur, bankruptcy proceedings are initiated and all related resources are transferred to the lender (Yan, 1996). It is well documented that a significant amount of funds to micro and small firms are provided by owners or households (Berger and Udell, 1998; Romano *et al.*, 2001; Winborg and Landström, 2000; Yilmazer and Schrank, 2006; Seppa, 2010; Coleman and Robb, 2009). Such debt, defined as inside-debt, often does not carry any regular amortization plan. Repayments are made

The author would like to thank Toomas Raus (Senior Research Fellow at Institute of Mathematics, University of Tartu) for his helpful comments in logit regression analysis.

Baltic Journal of Management
Vol. 9 No. 2, 2014
pp. 168-188

1746-5265
DOI 10.1108/BJM-03-2013-0043

when the firm has sufficient cash available; discipline of inside-debt repayment is similar to dividend payments. It follows that inside-debt neither triggers bankruptcy proceedings nor increases bankruptcy probability. All these arguments support the idea of classifying inside-debt as an equity instrument (Seppa, 2008). Indeed, credit providers do consider inside-debt as quasi-equity despite the lack of sound empirical evidence[1]. According to the author's best knowledge, existing literature includes no research studies investigating relations between inside-debt and bankruptcy probability. Seppa (2010) found that inside-debt is significantly and positively related to financial leverage. Positive leverage – bankruptcy relation is well documented in existing academic literature.

The current research study is built on the presumption that the influences of inside-debt and equity are not homogenous and that idiosyncratic influences of inside-debt signal for increased risk profile of a firm. Findings of the study indicate that inside-debt – bankruptcy relation is positive and significant. Inside-debt has signalling power to predict the occurrence of bankruptcy. The research field is seen as highly topical for increasing our understanding about financial risk, firm behaviour and capital structure development. Implications of inside-debt should be revised in a lending industry, findings should supplement prudent credit risk assessment techniques and bankruptcy models in general.

The rest of the paper is structured as follows. In Section 2 the literature review is provided. It emerges that the inside-debt variable (IDE) is not included in any of the known bankruptcy prediction models, thus referring to a research gap. The literature review ends with a single hypothesis formulated for this research study. In Section 3, research data and methodology are presented, while research results are presented in Section 4. The paper ends with a discussion in Section 5, followed by the conclusion in Section 6.

2. Literature review and research hypothesis

Inside-debt, the capital provided by principal owners or households, has not been discussed much in academic literature. There are studies related to the tax effect of inside-debt (Ayers *et al.*, 2001), inside bank loans (Bailey *et al.*, 2011) and managerial compensation plans (Edmans and Liu, 2011; Meckling and Jensen, 1976; Sundaram and Yermack, 2008; Anantharaman *et al.*, 2011; Tung and Wang, 2011). Capital structure theories describe debt-equity choices whereby debt is classified as interest-bearing obligations owed to external credit providers, equity is taken as booked in the balance sheet. According to financial reporting standards, inside-debt is booked as a standard debt contract in the balance sheet of small firms. Origin of inside-debt is described in appendices to financial reports which makes observing for external stakeholders hard. Although industry and macro variables are found to be useful (Chava and Jarrow, 2004; Hillegeist *et al.*, 2004; Jacobson *et al.*, 2008), the majority of bankruptcy prediction models are constructed on conventional financial ratios. Comprehensive studies reviewing a wide range of financial ratios (Chen and Shimerda, 1981; Back *et al.*, 1996; Yazdanfar and Nilsson, 2008) indicate that inside-debt has not been included among potential ratio candidates. In this study bankruptcy prediction models developed by Ohlson (1980), Kocagil *et al.* (2003) and Altman and Sabato (2007) are employed; variables are presented in Table I. Variables in the Ohlson (1980) model were selected for their simplicity. Kocagil *et al.* (2003) tested variables for their predictive power using the accuracy ratio;

Table I.
Independent variables in OS, KST and AS models

OS model	KST model	AS model
SIZE = log(total assets)	TLTA = total liabilities/total assets	SDEB = short term debt/equity book value
TLTA = total liabilities/total assets	NCTA = (short-term debt – cash)/total assets	CTA = cash/total assets
WCTA = working capital/total assets	PPTA = pre-tax profit/total assets	ETA = EBITDA/total assets
CLCA = current liabilities/current assets	EFE = ordinary P&L/financial expenses	RETA = retained earnings/total assets
OENEG = 1 if equity $<$ 0, 0 if equity $>$ 0	ESD = EBITDA/short-term debt	EIE = EBITDA/interest expenses
NITA = net income/total assets	CAL = (current assets − short-term debt)/liabilities	
FUTL = funds provided by operations/total liabilities	CCA = cash/current assets	
INTWO = 1 if negative net income for the last two years		
CHIN = $(NI_t - NI_{t-1})/(ABS(N_t) + ABS(N_{t-1}))$, where NI_t is net income for the most recent period		

variables with low predictive power were excluded. Altman and Sabato (2007) utilized a two-step approach. Ten variables were selected from potential ratio candidates based on the accuracy ratio. The final five variables were chosen by estimating the full model using statistical forward stepwise procedure. They further used logarithmic transformation for all the five selected variables in order to reduce the range of possible values and possibly increase the importance of the information.

Since the introduction of capital structure theory by Modigliani and Merton (1958), a number of research studies have been devoted to explore firms' capital structure development. Research studies have focused on the question of whether firms follow some target ratio (trade-off theories) or capital structure development is a random process depending on investment and financing opportunities (pecking-order theories). There is no consensus in academic literature as both theories are lacking satisfactory description of capital structure choices in practice (Gaud *et al.*, 2004; Graham and Harvey, 1999). Bigger companies are found to have target debt ratios in the long run (Faulkender *et al.*, 2007; Flannery *et al.*, 2006) but they constantly deviate from the target level. Trade-off theories predict that firms pursue their targets by a mixture of debt-equity to balance costs and benefits of debt instruments. When firms deviate from the target structure, they begin to gradually reduce the gap between the observed and the target capital structure (Flannery *et al.*, 2006; Huang and Ritter, 2009; Farhat *et al.*, 2006). Other studies show that the capital re-structuring is problematic due to high adjustment costs (Leary and Roberts, 2005; Gaud *et al.*, 2004; Titman and Wessels, 1988; Ju *et al.*, 2002). Agency theory predicts that debt improves firm's efficiency through the risk of failure to make debt service payments and decreases costs of the principal-agent conflict, as debt repayments reduce free cash flows that would be otherwise available to the agent to pursue his own interests and increase his power (Jensen, 1986). Small firms are found to follow the pecking order theory in their capital structure development (Seppa, 2008; Sander, 1998, 2003; De Haas and Peeters, 2004; Nivorozhkin, 2004; Mayer and Sussman, 2004; Tucker and Stoja, 2004; Farhat *et al.*, 2006). That is, firms first utilize their internal funds followed by the utilization of external debt and issue new equity as the least preferred capital source. In literature, internal funds are referred to as the sum of all kind of contributions of the owner and the net worth plus retained earnings of business (Baldi and Zazzara, 2006; Berger and Udell, 1998) and funds from friends and family members (Lucey and Ciarán mac an, 2006; Fluck *et al.*, 1998). It is well documented that internal funds are preferred over external debt and external equity (equity to new owners) to avoid ownership diffusion and loss of control (Daskalakis and Psillaki, 2008; Lucey and Ciarán mac an, 2006; Sander, 1998, 2003). There are no empirical studies investigating why owner-managers substitute inside-debt for a new equity when the risk of ownership diffusion and loss of control are eliminated.

Seppa (2010) suggests that owners are motivated to substitute inside-debt for equity when business risk is high. Indeed, residual claims of equity owners are sub-ordinated to other stakeholders including inside-debt holders. Inside-debt transfers claimant rights of the debt holder to owners and improves their position in bankruptcy and legal restructuring proceedings. For example, owners can use debt restructuring of a distressed firm to avoid bankruptcy, which otherwise would benefit external debt holders under an asset liquidation scenario. Alternatively, dilution of proceeds from the realization of the firm's assets may force external creditors to rely on future cash flows and avoid bankruptcy. Consequently, inside-debt provides an effective way to protect owners' wealth at the cost of other creditors. This kind of strategic thinking assumes rational or bounded rational behaviour, which contradicts empirical findings evidencing that small firms are less rational in their decision process and often behave intuitively (Smith *et al.*, 1998; Brouthers *et al.*, 1998; Byers and Slack, 2001; Liberman-Yaconi *et al.*, 2010).

In the long run the capital structure choices are determined by the firm's growth perspective and owner-manager commitment towards the firm. Schwienbacher (2007) defines three types of entrepreneurs – life-style, serial and "profit-maximizing" entrepreneurs. A life-style entrepreneur aims to build his own company and run it in the future while a serial entrepreneur intends to build up a new company once the previous one is successfully completed (Schwienbacher, 2007). The serial entrepreneur has a much shorter time horizon for reaping the benefits at the moment of his exit and should theoretically be motivated to use inside-debt to collect invested money should his firm fail to generate the expected earnings. Ou and Haynes (2006) found that younger and lower quality firms are more likely to acquire internal equity, including inside-debt, than other firms. Other findings indicate that the use of inside-debt is significantly associated with owners who do not have formal planning processes in place (Romano *et al.*, 2001); Seppa (2010) found that the use of inside-debt is positively related to financial leverage and non-core business activities. Findings support the prediction that inside-debt serves as a signal for a higher risk profile of a firm. I formulate the hypothesis that the use of inside-debt is positively related to bankruptcy probability.

3. Data and methodology

The two most widely used techniques to predict bankruptcies are the regression and the multivariate discriminant models. In this study the logit regression model is used as the multivariate discriminant model does not allow us to test the significance of individual variables[2]. Inside-debt variables are tested on models developed by Ohlson (1980), Kocagil *et al.* (2003) and Altman and Sabato (2007), hereinafter referred to as OS, KST and AS, respectively. These three models are chosen as they are found to be the top bankruptcy prediction models for small and mid-size firms (Pramborg, 2012). The amount of inside-debt is not readily observable in financial accounts. In balance sheets, inside-debt is booked under interest-bearing obligations or other liabilities. Reference to the origin of inside-debt is given in appendices to financial accounts and needs to be manually traced. The rather moderate sample size is due to lack of mass data. Three inside-debt ratios are developed to measure the weight of inside-debt to other capital structure components. The proportion of inside-debt is measured to total liabilities excluding inside-debt, book equity and total assets (Table II).

From the three ratio candidates, one ratio with strongest Spearman's rho correlation to occurrence of bankruptcy is selected for further analysis. The chosen IDE is added to the original AS, KST and AS logit regression models. Regression results are tested for the multicollinearity problem by running a regression of unstandardized residuals μ (dependent variable) against nominal and squared IDE (independent variables). As an alternative multicollinearity test, VIF factors are calculated by running ordinary regression model[3].

Marginal effects of inside-debt are calculated by inserting the nominal and squared IDE into the original OS, KST and AS models. In logit models the marginal effect is not constant. Marginal effect is measured as change in probabilities P^* for a given IDE when parameters of all other independent variables are kept at their mean values. Change in probabilities (P^*) is calculated as $P^* = P_1 - P_0$ where $P_i = 1/1 + e^{-Z}$ (Z – model outcome; P_1 – probability value for given values of an IDE; P_0 – probability value when the value of the IDE equals 0).

Finally a robustness test is performed. All variables from the original OS, KST and AS models are incorporated into the test model. Using the backward method, non-significant variables ($p > 0.1$) are removed. Inside-debt variable are then tested on the developed parsimonious model by running the same methodological procedures as described for original OS, KST and AS models.

The sample includes randomly selected Estonian small firms. The criteria for small firms are taken from the Recommendation 2003/361/EC adopted by the European Commission on 6 May 2003[4]. Firms operating in certain specific sectors are excluded:

- *Public utilities.* Public utilities often have a natural monopolistic position, regulated prices, and receive financial support from state or municipalities.
- *Agriculture.* Financially supported and subsidized by the state.
- *Real-estate.* Real-estate companies are often established for a single project and their success or failure is dependent on qualitative rather than on quantitative factors.
- *Banking and insurance.* A highly leveraged and regulated sector.

Table II.
Inside-debt variables

Variable	Description
IDTA	Ratio of inside-debt to total assets
IDTL	Ratio of inside-debt to total liabilities (inside-debt excluded from liabilities)
IDE	Ratio of inside-debt to book equity

Using a control group methodology, firms are divided into bankrupt and non-bankrupt firms matched by size of total assets. The sample consists of 157 firms that went bankrupt in 2009 and 157 non-bankrupt firms. The total sample consists of 314 firms including 111 firms using inside-debt (35 per cent of total sample). Bankruptcy data falls within the financial crisis period of 2008-2010 when the number of bankruptcies within Estonian companies increased by more than five times[5]. Although the crisis may have some impact on research results, the fundamental findings are robust to indicate significant relation between the occurrence of bankruptcies and inside-debt. Bankruptcy is defined as permanent insolvency declared by a court decision. Permanent insolvency is recognized when a firm is not able to fulfil its debt obligations and such a situation cannot be remedied shortly. It takes approximately six to 12 months to declare bankruptcy once a legal claim is filed. In most cases, bankruptcies declared in 2009 were actually initiated in 2008. Bankruptcy momentum is reflected in the 2008 financials and therefore it is found appropriate to use the 2007 financials against bankruptcies declared in 2009 (financials are one year plus one day old for bankruptcies declared on 1 January 2009 and so on). Bankruptcy data is obtained from the Estonian Centre of Registers and Information Systems, and financial accounts are provided by the local Experian group company Krediidiinfo AS.

Booking inside-debt under liabilities biases capital structure ratios as inside-debt users seem more leveraged the more inside-debt they use. To avoid this problem, data is adjusted for inside-debt by deducting inside-debt from liabilities. In order to improve data normality distribution, Sori *et al.* (2006) suggest reducing the effect of outliers. To do that, financial variables are subject to 90 per cent winsorization[6]. There are debates in academic literature on whether outliers should be removed from a data sample or not. In their extensive review about data sampling, Hossari *et al.* (2007) recommended not to eliminate the outliers. Based on their recommendation, the data sample is not cleaned for outliers.

4. Results

4.1 Descriptive statistics

Descriptive statistics of variables are presented in Appendix 1 (Table AI). Cash generating ability (FUTL) and profitability (NITA) are clearly weaker for inside-debt users. Weak profitability of inside-debt users results in the significantly lower retained earnings (RETA) and liquidity position (CLCA, CTA) compared to non-users of inside-debt. TLTA, proxy to leverage is moderately higher for inside-debt users (0.597 and 0.515, respectively). Higher leverage of inside-debt users is also found by Seppa (2010). Mann-Whitney and Wilcoxon's non-parametric test (Table AII) confirms that at 95 per cent confidence level the financial differences between users and non-users are statistically significant with the exception for CHIN (measures change in net income between periods t and $t-1$) and EFE (proxy to financial expenses coverage ratio). Bankruptcy rate within inside-debt users is 65.8 per cent compared to 41.4 per cent within non-users. Descriptive statistics and the non-parametric test indicate that inside-debt users underperform non-users. Users have not retained enough internal capital and the injection of inside-debt has been chosen to support business operations. Weak performance alone, rather than inside-debt, may be the sole reason of bankruptcies. Multicollinearity problem will be tested in Section 4.3.

4.2 Correlation analysis

The Spearman's rho correlation table is presented in Appendix 2. Results indicate that at the 0.01 significance level, IDEs (IDTA, IDTL, IDE) are positively correlated to the occurrence of bankruptcies (BANK). Correlation of IDEs to financial variables follow the pattern suggested by descriptive statistics. Inside-debt variables are positively correlated[7] to CLCA, OENEG, INTWO, SDEB, NCTA and negatively to WCTA, NITA, FUTL, CTA, ETA, RETA, EIE, PPTA, ESD, CAL, CCA. In financial terminology, inside-debt is negatively correlated to profitability and liquidity and positively to short-term debt ratios. Expected positive correlation to TLTA (proxy to leverage) is weak – one IDE out of three has a significant and positive correlation to TLTA, however, the correlation coefficient is low (0.158). Liquidity is affected by profitability, the contrary is not theoretically valid[8]. The correlation results suggest that the use of inside-debt is driven by negative profitability. Inside-debt users have not generated sufficient amount of retained earnings to support business activities.

The correlation between financial variables and occurrence of bankruptcies is in line with theoretical assumptions. At the significance level of 0.01, bankruptcy is positively related to leverage (TLTA 0.492, OENEG 0.223, SDEB 0.303, NCTA 0.235), and negatively to liquidity (WCTA − 0.332, CLCA 0.353, CAL −0.314, CCA −0.194) and profitability (NITA −0.266, FUTL −0.323, RETA −0.449, PPTA −0.270) ratios. There is a significant correlation between most financial variables which is common to financial data samples.

4.3 Logit regression, multicollinearity test

Correlation between the three IDEs IDTA, IDTL and IDE is close to one (Table AIII). From the three variables, the highest correlation coefficient to dependent variable is reported for IDE (0.289**) and IDE is chosen for further analysis. Logit regression results (IDE included into original OS, KST and AS models) are presented in Appendix 3. IDE is significant in all three models ($p < 0.1$), parameter β positive signs correspond to the correlations results (OS: $\beta = 1.247$, $p = 0.000$; KST: $\beta = 1.098$, $p = 0.004$; AS: $\beta = 0.636$, $p = 0.066$).

The correlation and logit regression results suggest that inside-debt has power to predict bankruptcy probability. Correlation results indicate that the use of inside-debt is driven by negative profitability and the profitability may be the sole cause of bankruptcy, not inside-debt. Multicollinearity problem is tested by running regression of unstandardized residuals μ of the original models against nominal and squared IDE ($\mu = \alpha + \beta\ (IDE)$). Multicollinearity exists if the correlation between the variables is weak and independent variable appears insignificant in the regression model. Pearson's correlation results are presented in Table III, regression results in Table IV.

Dependent variable	IDE	Squared IDE
Unstandardized residuals (OS model)	0.250*	0.242*
Sig. (two-tailed)	0.000	0.000
Unstandardized residuals (KST model)	0.244*	0.248*
Sig. (two-tailed)	0.000	0.008
Unstandardized residuals (AS model)	0.104	0.127
Sig. (two-tailed)	0.209	0.121

Note: Correlation is significant at: *0.01 level

Table III.
Pearson correlation of IDE and squared IDE to unstandardized residuals

At the 0.01 significance level, results of OS and KST models reject the multicollinearity problem while AS model fails.

As an alternative test, VIF factors for variable IDE are calculated by inserting the variable into the original OS, KST and AS models. VIF factor below three rejects multicollinearity while the factor above three refers that the multicollinearity problem may exist. The factor above ten refers to a severe multicollinearity problem. VIF factors of IDE, calculated for all three models, remain between 1.370 and 1.661. The alternative VIF test rejects the multicollineraity problem.

4.4 Marginal effects

The shape of curves in OS and KST models is fairly similar – it is weakly S-shaped, flattening out on high level of IDE (Figure 1). This is in line with the theoretical assumption predicting that once an excess threshold level is exceeded, any marginal increase in inside-debt has little to add to its predictive power. OS model predicts that at IDE level of 0.5 (the amount of inside-debt equals half of book equity), bankruptcy probability of inside-debt users is 12.1 per cent-points higher than of non-users (4.4 per cent-points in KST model). At IDE levels of 1.0 and 2.0 the bankruptcy probability of an inside-debt user is higher 26 per cent-points and 50 per cent-points,

Model	Independent variable	Unstandardized coefficients β	SE	Standardized coefficients β	t	Sig.
OS	IDE	0.132	0.030	0.250	4.439	0.000
	Squared IDE	0.052	0.012	0.242	4.281	0.000
KST	IDE	0.111	0.042	0.244	2.665	0.009
	Squared IDE	0.044	0.016	0.248	2.711	0.008
AS	IDE	0.047	0.037	0.104	1.262	0.209
	Squared IDE	0.023	0.015	0.127	1.559	0.121

Table IV. Regression of unstandardized residuals

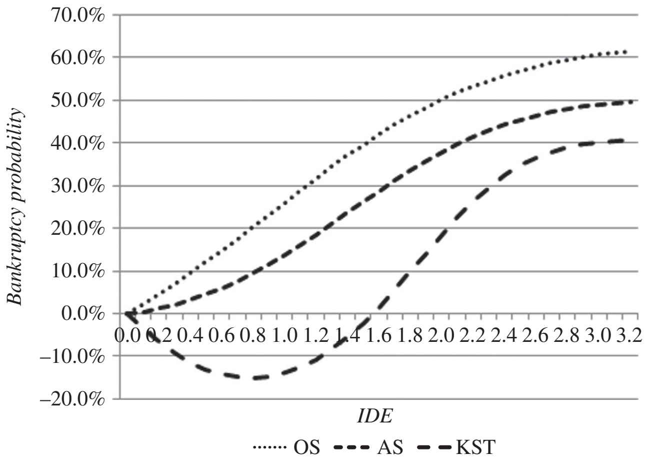

Figure 1. Marginal effects – OS, KST and AS models

respectively, (13.7 per cent-points and 37.8 per cent-points in KST model). Marginal effects suggest that excessive use of inside-debt indicates very high bankruptcy probability.

AS model predicts that the probability P^* curve is U-shaped. The model predicts that inside-debt is negatively related to bankruptcy probability and turns positive beyond a certain threshold level (IDE > 1.5 in this sample). AS results are excluded from concluding findings due to a possible multicollinearity problem.

4.5 Robustness test

OS, KST and AS models consist of 20 different financial variables. Only two variables appear significant in logit regression models – TLTA (OS and KST models) and RETA (AS model). Coefficient β signs of several variables contradict correlation results referring to possible multicollinearity. To eliminate the "noisy" effect of insignificant variables, a model is introduced combining only statistically significant variables. All 20 financial variables from OS, KST and AS models are gathered into one model, not significant variables ($p > 0.01$) are removed using backward method. The final model takes form $BANK = \alpha + \beta_1(NITA + \beta)_2(RETA + \mu)$. Coefficient β signs of the variables correspond to theoretical assumptions and correlation results. Next the variable IDE is inserted into the model and logit regression and multicollinearity tests are repeated as described in Section 4.3. Finally marginal effects are calculated.

In logit regression, IDE is significant and positively related to the dependent variable, coefficient β sign corresponds to the theoretical assumptions (Table V). Regression of unstandardized residuals ($\mu = \alpha + \beta_1(IDE)$, $\beta_1 = 0.062$; $p = 0.028$; $\mu = \alpha + \beta_1(IDE^2)$, $\beta_1 = 0.024$; $p = 0.031$) and the VIF factor (IDE 1.283) reject the multicollinerity problem. Marginal effects follow the same pattern depicted on OS and KST models (Figure 2).

Robustness test supports the results suggested by original models. Research results indicate that inside-debt is positively related to the occurrence of bankruptcies. Marginal prediction power is significant to signal for increased bankruptcy probability.

5. Discussion

So far inside-debt has not been investigated in conjunction with capital structure theories and bankruptcy risk. The principal question is why owners prefer to fund their businesses in the form of debt from owners instead of new equity to the existing owners?

Model summary						
-2 Log likelihood	332.963(a)					
Cox & Snell R^2	0.278					
Nagelkerke R^2	0.371					
Model sig.	0.000					
	B	*SE*	*Wald*	*df*	*Sig.*	*Exp(B)*
NITA	-2.403	0.579	17.218	1	0.000	0.090
RETA	-3.891	0.641	36.807	1	0.000	0.020
IDE	0.564	0.223	6.421	1	0.011	1.758
Constant	0.669	0.216	9.622	1	0.002	1.952

Note: Model $BANK = \alpha + \beta_1(NITA) + \beta_2(RETA + \beta_3(IDE) + \mu$

Table V.
Logit regression

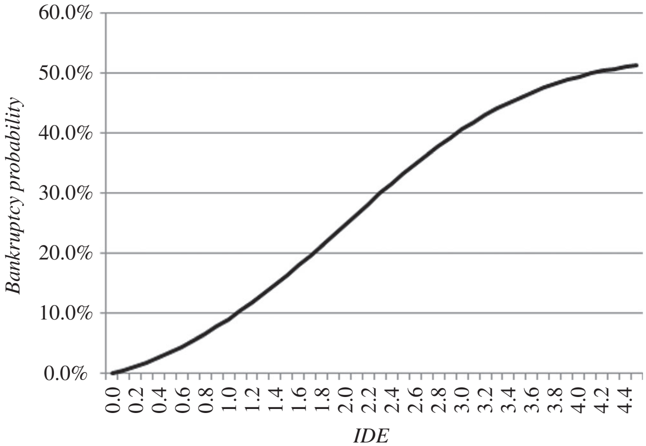

Figure 2.
Marginal effects – Robustness test model

Seppa (2010) suggested that owners are motivated to use inside-debt when they are uncertain about their business survival. Compared to equity, inside-debt reduces the risk of loss of the owner's funds in case of bankruptcy. Findings of the current study provide evidence that the use of inside-debt serves as a strong signal for increased bankruptcy risk compared to firms not using inside-debt. Findings should be of high interest to the lending industry as they seem to treat inside-debt as quasi-equity.

Results of the current study support the notion that business risk affects capital structure choices (Brettel *et al.*, 2009). Small firms, including Estonian small firms, are found to follow pecking order theory in their capital structure decisions (Sander, 1998, 2003; Seppa, 2008). The conventional pecking order theory and other capital structure theories do not differentiate inside-debt from internal funds. Findings of the research study indicate that the implication of inside-debt is non-trivial and the research gap should be closed. Pecking order theory assumes that firms first utilize internal funds followed by external credit and new equity is issued as the least preferred funding source. The principal research question for further studies is how inside-debt ranks within the funding choices and, in particular, whether the choice is affected by perceived risk profile of a firm. As noted earlier, use of inside-debt effectively transfers claimant rights of a debt holder to owners. In fact, owners may issue inside-debt primarily to improve their position in pending bankruptcy or legal restructuring proceedings instead of bolstering capital base for survival of the firm. It seems that inside-debt increases information asymmetry, risk of moral hazard and agency costs in general. I believe that the new dimension to the external debt holder – owner (inside-debt holder) conflict under different legal systems should be thoroughly investigated to supplement existing agency theory.

Static trade-off theory predicts that firms follow target leverage and gradually adjust their capital structure when deviation occurs. It remains puzzling how inside-debt affects adjustment speed and identification of capital structure in general. A firm exceeding target leverage may issue inside-debt instead of equity. For external observers the firm might become even more leveraged if inside-debt is not identified. Due to the lack of sound empirical studies, it is not clear how inside-debt should be evaluated in the context of trade-off theories. We also miss empirical studies investigating dynamics of inside-debt prior to bankruptcies. According to Estonian bankruptcy law, the claims for payment of inside-debt holders are equal to that of external creditors (*ceteris paribus*). From a theoretical perspective, this should serve as a strong motivation to substitute inside-debt for equity.

Findings of the study, supported by earlier findings in academic literature, suggest that the implication of inside-debt should be thoroughly investigated. I believe that insight into the field of inside-debt may contribute to existing capital structure theories and affect a broad range of research fields related to entrepreneurship and small business.

6. Conclusion

Micro and small firms extensively use inside-debt provided by principal owners as an alternative capital source to straight equity capital. Inside-debt has usually no fixed amortization plan; it is repaid when the company has sufficient funds available. Without any empirical evidence, inside-debt is assumed to carry no impact on bankruptcy risk, unlike standard debt. Previous studies show that the use of inside-debt is positively related to risk factors such as a weak planning process (Romano *et al.*, 2001), leverage and non-core business (Seppa, 2010). The results of the current study are in line with Ou and Haynes (2006) indicating that the users of inside-debt are more risky firms than other firms. These firms are less profitable, they have a weaker liquidity position and have retained less earnings. Leverage is not found to be a significant determinant between inside-debt users and non-users, though users are slightly more leveraged firms. The fundamental finding of the study, tested on three prominent bankruptcy prediction models of Ohlson (1980), Altman and Sabato (2007) and Kocagil *et al.* (2003), indicates that the use of inside-debt is significantly related to bankruptcy probability. While inside-debt carries no risk elements *per se*, findings are robust to indicate that the use of inside-debt reflects idiosyncratic influences and firm behaviour which are eventually transformed to bankruptcy risk. Findings suggest that excessive use of inside-debt signals for a significant increase in bankruptcy probability compared to firms not using inside-debt. If inside-debt equals book equity, bankruptcy probability will increase 13.7-26.0 per cent-points, and 37.8-50.2 per cent-points if the amount of inside-debt double-exceeds book equity.

Though this study is based on a single country and year data, findings provide new insight into the capital structure theories and contribute to the understanding about bankruptcy risk of small firms. Use of inside-debt has latent traits which have significant power to signal for occurrence of bankruptcy. Results suggest that the current credit risk measuring techniques should be revised in the lending industry. Signalling power of inside-debt should be employed in bankruptcy prediction models. Policymakers should consider reviewing accounting rules for inside-debt in order to reduce information asymmetries between internal and external stakeholders.

In academic literature, inside-debt should be linked to capital structure theories of SMEs. Other aspects of inside-debt need to be thoroughly investigated. For example, further research studies should focus on drivers of substituting inside-debt for equity, contractual characteristics and repayment preferences. The choice of inside-debt in the context of strategic decision-making and financial bootstrapping should be elaborated in more detail.

I recommend extending the investigation of inside-debt to other countries and domains with different legal environments. I further recommend re-running tests in more stable environments in order to eliminate the possible effects of economic boom and financial crisis on firms' performance.

Notes

1. Conventional equity is adjusted for inside-debt (adjusted equity = book equity + inside-debt).
2. See Eisenbeis (1977) for methodological and statistical problems in discriminant analysis procedures.
3. VIF factor cannot be computed for logit regression models.
4. Employees < 50, turnover < 10 mEUR, total assets < 10 mEUR.
5. Number of bankruptcies in Estonia: 2007 – 202, 2008 – 423, 2009 – 1055, 2010- 1029 (Source: Krediidiinfo AS).
6. Except dummies and SIZE (log(total assets)) in Ohlson (1980) model.
7. I discuss correlations at the significance level of 0.01 and where the correlation coefficient is higher than 0.200.
8. Liquidity ratios are significantly and positively correlated to profitability ratios (e.g. WCTA – NITA 0.448(**), WCTA − FUTL 0.597(**)).

References

Altman, E.I. and Sabato, G. (2007), "Modeling credit risk for SMEs: evidence from the US market", *Abacus*, Vol. 43 No. 3, pp. 332-357.

Anantharaman, D., Fang, V.W. and Gong, G. (2011), "Inside debt and the design of corporate debt contract", paper presented at Fifth Singapore International Conference on Finance 2011, available at: http://ssrn.com/abstract=1743634; http://dx.doi.org/10.2139/ssrn.1743634 (accessed 20 February 2013).

Ayers, B.C., Cloyd, C.B. and Robinson, J.R. (2001), "The influence of income taxes on the use of inside and outside debt by small businesses", *National Tax Journal*, Vol. 54 No. 1, pp. 27-55.

Back, B., Laitinen, T., Sere, K. and Van Wezel, M. (1996), "Choosing bankruptcy predictors using discriminant analysis, logit analysis, and genetic algorithms", Turku Centre for Computer Science Technical Report No. 40.

Bailey, W., Huang, W. and Yang, Z. (2011), "Bank loans with Chinese characteristics: some evidences on inside debt in a state-controlled banking system", *Journal of Financial and Quantitative Analysis*, Vol. 46 No. 6, pp. 1795-1830.

Baldi, F. and Zazzara, C. (2006), "Who uses equity capital among SMEs? Evidence from survey data", p. 22, available at: http://ssrn.com/abstract=876184 (accessed 11 January 2009).

Berger, A.N. and Udell, G.F. (1998), "The economics of small business finance: the roles of private equity and debt markets in the financial growth cycle", *Journal of Banking and Finance*, Vol. 22 Nos 6-8, pp. 613-673.

Brettel, M., Breuer, W., Espel, P. and Abedin, A. (2009), "Private equity for SME: a behavioural model of the demand-side perspective", available at: http://dx.doi.org/10.2139/ssrn.1141068 (accessed 7 April 2012).

Brouthers, K., Andriessen, F. and Nicolaes, I. (1998), "Driving blind: strategic decision-making in small companies", *Long Range Planning*, Vol. 311 No. 1, pp. 130-138.

Byers, T. and Slack, T. (2001), "Strategic decision-making in small businesses within the leisure industry", *Journal of Leisure Research*, Vol. 33 No. 2, pp. 121-136.

Chava, S. and Jarrow, R.A. (2004), “Bankruptcy prediction with industry effects”, *Review of Finance*, Vol. 8 No. 4, pp. 537-569.

Chen, K. and Shimerda, T. (1981), “An empirical analysis of useful financial ratios”, *Financial Management*, Vol. 10, pp. 51-60.

Coleman, S. and Robb, A. (2009), “A comparison of new firm financing by gender: evidence from the Kauffman firm survey data”, *Small Business Economics*, Vol. 33, pp. 397-411.

Daskalakis, N. and Psillaki, M. (2008), “Do country or firm factors explain capital structure? Evidence from SMEs in France and Greece”, *Applied Financial Economics*, Vol. 18, pp. 87-97.

de Haas, R. and Peeters, M. (2004), “The dynamic adjustment towards target capital structures of firms in transition economies”, Working Paper 87, EBRD, available at: www.ebrd.com/pubs/econo/wp0087.pdf (accessed 20 February 2012).

Edmans, A. and Liu, Q. (2011), “Inside debt”, *Review of Finance*, Vol. 15, pp. 75-102.

Eisenbeis, R.A. (1977), “Pitfalls in the application of discriminant analysis in business, finance, and economics”, *Journal of Finance*, Vol. 32 No. 3, pp. 875-890.

Farhat, J., Cotei, C. and Abugri, B.A. (2006), “The pecking order hypothesis vs. the static trade-off theory under different institutional environments”, available at: http://wehner.tamu.edu/finc.www/seminar/papers/CovFinance31Jan2007.pdf (accessed 31 January 2010).

Faulkender, M., Flannery, M.J., Hankins, K.W. and Smith, J.M. (2007), “Do adjustment costs impede the realization of target capital structure?”, Meetings Paper, p. 41, AFA 2008 New Orleans, LA, available at: http://ssrn.com/abstract=972148 (accessed 6 April 2009).

Flannery, M., Rangan, J. and Kasturi, P. (2006), “Partial adjustment toward target capital structures”, *Journal of Financial Economics*, Vol. 79 No. 3, pp. 469-506.

Fluck, Z., Holtz-Eakin, D. and Rosen, H. (1998), “Where does the money come from? The financing of small entrepreneurial enterprises”, Metropolitan Studies Program Series, Occasional Paper No. 191, p. 46.

Gaud, P., Hoesli, M. and Bender, A. (2004), “Further evidence on debt-equity choice”, Research Paper No. 114, Universite of Geneve, Geneve, p. 38.

Graham, J.R. and Harvey, C.R. (1999), “The theory and practice of corporate finance: evidence from the field”, working paper, AFA 2001 New Orleans, LA, Duke University, available at: http://ssrn.com/abstract=220251 (accessed 16 August 2005).

Hillegeist, S.A., Keating, E.K., Cram, D.P. and Lundstedt, K.G. (2004), “Assessing the probability of bankruptcy”, *Review of Accounting Studies*, Vol. 9 No. 1, pp. 5-34.

Hossari, G., Rahman, S.F. and Ratnatunga, J. (2007), “An empirical evaluation of sampling controversies in ratio-based modelling of corporate collapse”, *Journal of Applied Research in Accounting and Finance*, Vol. 2 No. 2, pp. 15-26.

Huang, R. and Ritter, J.R. (2009), “Testing theories of capital structure and estimating the speed of adjustment”, *Journal of Financial and Quantitative Analysis*, Vol. 44 No. 2, pp. 237-271.

Jacobson, T., Kindell, R., Lindé, J. and Roszbach, K.F. (2008), “Firm default and aggregate fluctuations”, FRB of Philadelphia Working Paper No. 08-21, available at: http://ssrn.com/abstract=1170442 (accessed 13 June 2010).

Jensen, M.C. (1986), “Agency cost of free cash flow, corporate finance, and takeovers”, *American Economics Review*, Vol. 76 No. 2, pp. 323-329.

Ju, N., Parrino, R., Poteshman, A.M. and Weisbach, M.S. (2002), "Horses and rabbits? Optimal dynamic capital structure from shareholders and managers perspective", p. 45, available at: http://ssrn.com/abstract=345821 (accessed 9 August 2005).

Kocagil, A.E., Seiberlich, N., Teymur, Ö., Grass, A., Parillon, E., Escott, P. and Glormann, F. (2003), "Moody's RiskCalcTM for private companies: Nordic region", Moody's Report on Rating Methodology.

Leary, M.T. and Roberts, M.R. (2005), "Do firms rebalance their capital structure", *Journal of Finance*, Vol. 60 No. 6, pp. 2575-2619.

Liberman-Yaconi, L., Hooper, T. and Hutchings, K. (2010), "Toward a model of understanding strategic decision-making in micro-firms: exploring the Australian information technology sector", *Journal of Small Business Management*, Vol. 48 No. 1, pp. 70-95.

Lucey, B. and Ciarán mac an, B. (2006), "What determines the capital structure of SMEs: Irish evidence", p. 31, available at: http://ssrn.com/abstract=905845 (accessed 5 March 2007).

Mayer, C. and Sussman, O. (2004), "A new test of capital structure", paper presented at AFA 2005 Philadelphia Meetings, available at: http://ssrn.com/abstract=643388 (accessed 12 February 2012).

Meckling, W.H. and Jensen, M.C. (1976), "Theory of the firm: managerial behavior, agency costs and ownership structure", *Journal of Financial Economics*, Vol. 3 No. 4, pp. 305-360.

Modigliani, F. and Merton, M. (1958), "The cost of capital, corporation finance and the theory of investment", *American Economic Review*, Vol. 48, pp. 261-297.

Nivorozhkin, E. (2004), "Financing choices of firms in EU accession countries", BOFIT Discussion Papers No. 6, p. 48.

Ohlson, J.A. (1980), "Financial ratios and the probabilistic prediction of bankruptcy", *Journal of Accounting Research*, Vol. 18 No. 1, pp. 109-131.

Ou, C. and Haynes, G.W. (2006), "Acquisition of additional equity capital by small firms – findings from the national survey of small business finances", *Small Business Economics*, Vol. 27, pp. 157-168.

Pramborg, B. (2012), "Accounting variables and bankruptcy risk for non-listed firms", available at: http://ssrn.com/abstract=1482998 (accessed 20 February 2013).

Romano, C.A., Tanewski, G.A. and Smyrnios, K.X. (2001), "Capital structure decision making: a model for family business", *Journal of Business Venturing*, Vol. 16 No. 3, pp. 285-310.

Sander, P. (1998), "Kapitali Struktuuri Valik Ja Laenukapitali Maksueelis", MA dissertation, University of Tartu, Tartu, p. 129.

Sander, P. (2003), "Capital structure choice in Estonian companies: a survey", *Management of Organizations: Systematic Research*, No. 27, pp. 123-135.

Schwienbacher, A. (2007), "A theoretical analysis of optimal financing strategies for different types of capital-constrained entrepreneurs", *Journal of Business Venturing*, Vol. 22, pp. 753-781.

Seppa, R. (2008), "Capital structure decisions: research in Estonian non-financial companies", *Baltic Journal of Management*, Vol. 3 No. 1, pp. 55-70.

Seppa, R. (2010), "Implication of inside-debt among small- and medium-size enterprises", *International Research Journal of Finance and Economics*, Vol. 44, pp. 148-160.

Smith, K.G., Gannon, M.J., Grimm, C. and Mitchell, T.R. (1998), "Decision making behaviour in smaller entrepreneurial and larger professionally managed firms", *Journal of Business Venturing*, Vol. 3, pp. 223-232.

Sori, Z.M., Hamid, M.A.A., Nassir, A.M. and Mohamad, S. (2006), "Some basic properties of financial ratios: evidence from an emerging capital markets", *International Research Journal of Finance and Economics*, Vol. 2, pp. 72-87.

Sundaram, K.R. and Yermack, L.D. (2008), "Pay me later: inside debt and its role in managerial compensation", *The Journal of Finance*, Vol. 62 No. 4, pp. 1551-1588.

Titman, S. and Wessels, R. (1988), "The determinants of capital structure choices", *Journal of Finance*, Vol. 43 No. 1, pp. 1-19.

Tucker, J. and Stoja, E. (2004), "Target gearing in UK", available at: http://ssrn.com/abstract=710325 (accessed 9 December 2011).

Tung, F. and Wang, X. (2011), "Bank CEOs, inside debt compensation, and the global financial crisis", Working Paper No. 11-49, paper presented at 5th Annual Conference on Empirical Legal Studies Paper, Boston Univ. School of Law, available at: http://ssrn.com/abstract=1570161; http://dx.doi.org/10.2139/ssrn.1570161 (accessed 20 February 2013).

Winborg, J. and Landström, H. (2000), "Financial bootstrapping in small businesses: examining small business managers' resource acquisition behaviours", *Journal of Business Venturing*, Vol. 16, pp. 235-254.

Yan, E.Y. (1996), "Credit rationing, bankruptcy cost, and optimal debt contract for small business", available at: http://ssrn.com/abstract=1246 (accessed 16 August 2005).

Yazdanfar, D. and Nilsson, M. (2008), *The Bankruptcy Determinants of Swedish SMEs*, ISBE, Belfast, pp. 5-7.

Yilmazer, T. and Schrank, H. (2006), "Financial intermingling in small family businesses", *Journal of Business Venturing*, Vol. 21 No. 5, pp. 726-751.

Corresponding author
Raul Seppa can be contacted at: raulseppa@outlook.com

Appendix 1

Variable	Inside-debt users n	Mean	SD	Min.	Max.	Non-users n	Mean	SD	Min.	Max.
BANK	111	0.658	0.477	0.000	1.000	203	0.414	0.494	0.000	1.000
SIZE	111	14.73	1.21	12.43	16.57	203	14.34	1.19	12.43	16.57
TLTA	111	0.597	0.289	0.026	1.114	203	0.515	0.318	0.026	1.114
WCTA	111	−0.056	0.384	−0.805	0.848	203	0.254	0.395	−0.805	0.851
CLCA	111	1.590	1.272	0.033	4.332	203	0.804	0.851	0.033	4.332
OENEG	111	0.171	0.378	0.000	1.000	203	0.044	0.206	0.000	1.000
NITA	111	−0.075	0.296	−0.882	0.473	203	0.057	0.310	−0.882	0.473
FUTL	111	0.690	1.848	−0.579	9.774	200	1.820	2.777	−0.579	9.774
INTWO	101	0.198	0.400	0.000	1.000	199	0.080	0.273	0.000	1.000
CHIN	101	−0.190	0.756	−1.000	1.000	199	−0.050	0.716	−1.000	1.000
SDEB	111	1.381	1.400	0.000	3.433	203	0.291	0.765	0.000	3.433
CTA	111	0.084	0.138	0.001	0.807	203	0.256	0.254	0.001	0.807
ETA	111	0.137	0.312	−0.532	0.926	203	0.332	0.363	−0.532	0.926
RETA	111	0.111	0.253	−0.334	0.798	203	0.252	0.272	−0.334	0.798
EIE	68	23.20	77.70	−26.63	373.18	81	67.15	109.5	−26.63	373.2
NCTA	111	0.118	0.230	−0.740	0.479	203	−0.205	0.297	−0.787	0.479
PPTA	111	−0.073	0.297	−0.882	0.488	203	0.067	0.314	−0.882	0.488
EFE	68	3.76	36.71	−46.15	156.6	81	14.45	48.06	−46.15	156.6
ESD	92	3.658	12.27	−1.043	75.02	83	14.76	23.00	−1.04	75.02
CAL	111	1.254	2.832	−0.145	18.15	203	3.560	5.314	−0.145	18.15
CCA	111	0.180	0.234	0.003	0.926	203	0.375	0.318	0.003	0.954

Table AI. Descriptive statistics of variables, grouped by inside-debt users and non-users

Table AII.
Mann-Whitney and Wilcoxon non-parametric test

Variable	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (two-tailed)
BANK	8,519.000	29,225.000	−4.125	0.000
SIZE	9,106.500	29,812.500	−2.809	0.005
TLTA	9,632.500	30,338.500	−2.125	0.034
WCTA	6,105.500	12,321.500	−6.711	0.000
CLCA	6,028.000	26,734.000	−6.812	0.000
OENEG	9,837.500	30,543.500	−3.764	0.000
NITA	7,723.500	13,939.500	−4.607	0.000
FUTL	7,077.000	13,293.000	−5.296	0.000
INTWO	8,867.500	28,767.500	−2.958	0.003
CHIN	8,800.000	13,951.000	−1.875	0.061
SDEB	4,730.500	25,436.500	−8.900	0.000
CTA	5,661.500	11,877.500	−7.289	0.000
ETA	7,364.500	13,580.500	−5.074	0.000
RETA	7,652.000	13,868.000	−4.701	0.000
EIE	1,921.000	4,267.000	−3.175	0.001
NCTA	3,884.000	24,590.000	−9.600	0.000
PPTA	7,615.500	13,831.500	−4.748	0.000
EFE	2,323.000	4,669.000	−1.643	0.100
ESD	2,224.000	6,502.000	−4.764	0.000
CAL	6,279.500	12,495.500	−6.485	0.000
CCA	6,713.000	12,929.000	−5.922	0.000

Note: Grouped by inside-debt users and non-users

Appendix 2

Table AIII. Correlation – Ohlson model (OS)

Variable	BANK	SIZE	TLTA	WCTA	CLCA	OENEG	NITA	FUTL	INTWO	CHIN	IDTA	IDTL	IDE
BANK	1.000	−0.001	0.492**	−0.332**	0.353**	0.223**	−0.266**	−0.323**	0.058	−0.104	0.250**	0.224**	0.289**
SIZE	−0.001	1.000	0.062	−0.143*	0.132*	−0.086	0.106	0.083	−0.107	0.005	0.106	0.110	0.123*
TLTA	0.492**	0.062	1.000	−0.691**	0.707**	0.367**	−0.455**	−0.624**	0.140*	−0.170**	0.094	0.051	0.158**
WCTA	−0.332**	−0.143*	−0.691**	1.000	−0.959**	−0.417**	0.448**	0.597**	−0.209**	0.173**	−0.389**	−0.369**	−0.420**
CLCA	0.353**	0.132*	0.707**	−0.959**	1.000	0.366**	−0.430**	−0.618**	0.199**	−0.164**	0.382**	0.365**	0.411**
OENEG	0.223**	−0.086	0.367**	−0.417**	0.366**	1.000	−0.456**	−0.405**	0.381**	−0.158**	0.302**	0.261**	0.311**
NITA	−0.266**	0.106	−0.455**	0.448**	−0.430**	−0.456**	1.000	0.765**	−0.451**	0.627**	−0.289**	−0.269**	−0.303**
FUTL	−0.323**	0.083	−0.624**	0.597**	−0.618**	−0.405**	0.765**	1.000	−0.336**	0.438**	−0.304**	−0.283**	−0.330**
INTWO	0.058	−0.107	0.140*	−0.209**	0.199**	0.381**	−0.451**	−0.336**	1.000	−0.017	0.202**	0.188**	0.198**
CHIN	−0.104	0.005	−0.170**	0.173**	−0.164**	−0.158**	0.627**	0.438**	−0.017	1.000	−0.106	−0.107	−0.103
IDTA	0.250**	0.106	0.094	−0.389**	0.382**	0.302**	−0.289**	−0.304**	0.202**	−0.106	1.000	0.994**	0.987**
IDTL	0.224**	0.110	0.051	−0.369**	0.365**	0.261**	−0.269**	−0.283**	0.188**	−0.107	0.994**	1.000	0.974**
IDE	0.289**	0.123*	0.158**	−0.420**	0.411**	0.311**	−0.303**	−0.330**	0.198**	−0.103	0.987**	0.974**	1.000

Note: Correlation is significant at: *0.05 and **0.01 levels (two-tailed)

Table AIV.
Correlation – Altman and Sabato model (AS)

Variables	BANK	SDEB	CTA	ETA	RETA	EIE	IDTA	IDTL	IDE
BANK	1.000	0.303**	−0.115*	−0.099	−0.449**	−0.209*	0.250**	0.224**	0.289**
SDEB	0.303**	1.000	−0.375**	−0.229**	−0.383**	−0.286**	0.482**	0.466**	0.522**
CTA	−0.115*	−0.375**	1.000	0.176**	0.167**	0.163*	−0.382**	−0.391**	−0.385**
ETA	−0.099	−0.229**	0.176**	1.000	−0.024	0.859**	−0.312**	−0.304**	−0.311**
RETA	−0.449**	−0.383**	0.167**	−0.024	1.000	0.109	−0.293**	−0.265**	−0.329**
EIE	−0.209*	−0.286**	0.163*	0.859**	0.109	1.000	−0.295**	−0.282**	−0.296**
IDTA	0.250**	0.482**	−0.382**	−0.312**	−0.293**	−0.295**	1.000	0.994**	0.987**
IDTL	0.224**	0.466**	−0.391**	−0.304**	−0.265**	−0.282**	0.994**	1.000	0.974**
IDE	0.289**	0.522**	−0.385**	−0.311**	−0.329**	−0.296**	0.987**	0.974**	1.000

Note: Correlation is significant at: *0.05 and **0.01 levels (two-tailed)

Variables	BANK	TLTA	NCTA	PPTA	EFE	ESD	CAL	CCA	IDTA	IDTL	IDE
BANK	1.000	0.492**	0.235**	−0.270**	−0.266**	−0.192*	−0.314**	−0.194**	0.250**	0.224**	0.289**
TLTA	0.492**	1.000	0.385**	−0.461**	−0.324**	−0.329**	−0.696**	−0.282**	0.094	0.051	0.158**
NCTA	0.235**	0.385**	1.000	−0.336**	−0.211**	−0.611**	−0.672**	−0.669**	0.529**	0.526**	0.540**
PPTA	−0.270**	−0.461**	−0.336**	1.000	0.910**	0.671**	0.388**	0.255**	−0.295**	−0.275**	−0.310**
EFE	−0.266**	−0.324**	−0.211**	0.910**	1.000	0.610**	0.185*	0.153	−0.194*	−0.175*	−0.204*
ESD	−0.192*	−0.329**	−0.611**	0.671**	0.610**	1.000	0.554**	−0.001	−0.421**	−0.397**	−0.426**
CAL	−0.314**	−0.696**	−0.672**	0.388**	0.185*	0.554**	1.000	0.232**	−0.346**	−0.329**	−0.378**
CCA	−0.194**	−0.282**	−0.669**	0.255**	0.153	−0.001	0.232**	1.000	−0.315**	−0.315**	−0.320**
IDTA	0.250**	0.094	0.529**	−0.295**	−0.194*	−0.421**	−0.346**	−0.315**	1.000	0.994**	0.987**
IDTL	0.224**	0.051	0.526**	−0.275**	−0.175*	−0.397**	−0.329**	−0.315**	0.994**	1.000	0.974**
IDE	0.289**	0.158**	0.540**	−0.310**	−0.204*	−0.426**	−0.378**	−0.320**	0.987**	0.974**	1.000

Note: Correlation is significant at: *0.05 and **0.01 levels (two-tailed)

Table AV.
Correlation – Kocagil *et al.* model (KST)

Appendix 3

Model summary						
−2 Log likelihood	302.679(a)					
Cox & Snell R^2	0.306					
Nagelkerke R^2	0.409					
Model sig.	0.000					
Variables	*B*	*SE*	*Wald*	*df*	*Sig.*	*Exp(B)*
SIZE	−0.057	0.123	0.219	1	0.640	0.944
TLTA	4.523	0.841	28.907	1	0.000	92.107
WCTA	1.034	0.902	1.314	1	0.252	2.812
CLCA	−0.069	0.256	0.073	1	0.788	0.933
OENEG	−0.604	0.871	0.481	1	0.488	0.546
NITA	−0.109	0.853	0.016	1	0.898	0.897
FUTL	−0.111	0.113	0.978	1	0.323	0.895
INTWO	−0.355	0.514	0.477	1	0.490	0.701
CHIN	−0.007	0.218	0.001	1	0.975	0.993
IDE	1.247	0.279	20.002	1	0.000	3.479
Constant	−2.016	1.929	1.092	1	0.296	0.133

Table AVI.
Logit regression – Ohlson model (OS)

Model summary						
−2 Log likelihood	161.513(a)					
Cox & Snell R^2	0.228					
Nagelkerke R^2	0.309					
Model sig.	0.000					
Variables	*B*	*SE*	*Wald*	*df*	*Sig.*	*Exp(B)*
SDEB	−0.012	0.238	0.002	1	0.961	0.988
CTA	0.458	1.097	0.174	1	0.676	1.581
ETA	−0.873	0.732	1.423	1	0.233	0.418
RETA	−3.595	0.957	14.114	1	0.000	0.027
EIE	0.001	0.002	0.058	1	0.809	1.001
IDE	0.636	0.346	3.377	1	0.066	1.888
Constant	1.070	0.470	5.188	1	0.023	2.916

Table AVII.
Logit regression – Altman and Sabato model (AS)

Model summary						
−2 Log likelihood	121.994(a)					
Cox & Snell R^2	0.232					
Nagelkerke R^2	0.315					
Model sig.	0.000					
Variables	*B*	*SE*	*Wald*	*df*	*Sig.*	*Exp(B)*
TLTA	2.794	1.150	5.905	1	0.015	16.342
NCTA	−1.680	1.624	1.070	1	0.301	0.186
PPTA	−0.328	1.073	0.093	1	0.760	0.721
EFE	−0.002	0.008	0.047	1	0.828	0.998
ESD	−0.015	0.016	0.833	1	0.361	0.985
CAL	−0.047	0.134	0.122	1	0.727	0.954
CCA	−0.105	1.240	0.007	1	0.932	0.900
IDE	1.098	0.377	8.501	1	0.004	2.999
Constant	−1.452	0.950	2.336	1	0.126	0.234

Table AVIII.
Logit regression – Kocagil *et al.* model (KST)